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SOME NEW SPECIES OF LEAFHOPPERS (HOMOPTERA-CICADELLIDAE)

R. H. BEAMER, Lawrence, Kansas *

1. **Laevicephalus hyalinus** n. sp. Fig. 1.

Resembling **Laevicephalus labeculus** DeL. but head sharper, median process of posterior margin of last ventral segment of female shorter, apices of male plates truncate and aedeagus with 45 degree bend near outer fourth. Length 3 mm.

Head considerably wider than body; vertex about as long as width between eyes, about a right angle, fairly rounding with front, disc flat, often quite concave; elytra longer than abdomen in both sexes.

Color: General color milky white to semihyaline. Vertex with frontal dark arcs visible and two longitudinal chain marks with openings in chain almost closed; some specimens hyaline throughout, others with more or less dark markings bordering veins.

Genitalia: Female last ventral segment twice as long as preceding, lateral margins broadly rounded to notch either side of a sharp median tooth. Male valve longer than preceding segment, broadly angular; plates broader than valve at base, outer margins evenly narrowed to sharply truncate apices, style heavy, slightly constricted just above apex to become avicephaliform; aedeagus in lateral view long and tapering, bent at right angles near basal fourth and again bent out at about 45 degree on outer fourth, apex with a pair of retrorse lateral processes about as long as length of shaft from last bend of apex.

Holotype male, allotype female, and numerous paratypes, Creede, Colo., July 6, 1937, R. H. Beamer, and Paposa Springs, Colo., 1937.

* Contribution from Department of Entomology, University of Kansas.

All types of new species in the Snow Collection.

Illustrations by Miss Maxine Graham.

2. **Laevicephalus hamatus** n. sp. Fig. 2.

Resembling **Laevicephalus hyalinus** n. sp. but smaller, head much more acute, disc of vertex slightly convex and male aedeagus with sagittate apex instead of with two retrorse processes. Length 2.5 mm.

Head wider than thorax, vertex acute, median length distinctly longer than width between eyes, disc usually slightly convex. Elytra longer than abdomen.

General ground color semihyaline to whitish with fumose markings. Vertex with pair of smoky longitudinal stripes, pointed at apex and with short white dash inclusion at base. Veins more or less infuscated.

Genitalia: Last ventral segment of female at the middle more than twice as long as preceding, at margins about the same length, posterior margin thus evenly produced at middle about its own length. Valve of male rounded; plates long, outer margins almost straight converging to sharp apices; styles sharply narrowed on outer third, curving sharply outward; aedeagus in dorsoventral view long, sides slightly converging to sagittate apex, with pair of very blunt processes or teeth before tip.

Holotype male, allotype female and 11 female paratypes, George West, Texas, July 4, 1936, R. H. Beamer.

3. **Hebecephalus pagosus** n. sp. Fig 3.

Resembling **Hebecephalus cruciatus** O. & B., but slightly larger, posterior margins of last ventral segment of female slightly produced instead of excavated and aedeagus of male much longer and more slender with slightly sagittate apex. Length 2.75-3 mm.

Head wider than pronotum; vertex sharp, about a right angle; elytra as long as abdomen in female, longer in male.

General ground color cinereous, strongly marked with fuscous. Vertex with frontal arcs visible on lateral margins, disc with three sets of fuscous spots, a pair of small triangles at apex, a dark pair of L marks near middle and 2 pairs of converging dashes at base. Pronotum with three pairs of more or less definite longitudinal dashes with heavier irregular marks along anterior margin. Veins of elytra evenly bordered with fuscous.

Genitalia: Last ventral segment of female about twice as long as preceding, lateral margins round, slight-

ly exposing underlying membrane, posterior margin slightly produced throughout middle two-thirds. Male valve obtusely rounding, plates long, slightly sinuate on outer margin, narrowed to bluntly angular apices, inner margins longest; styles narrowed on outer third, curved out; aedeagus long and narrow with slightly sagittate apex.

Holotype male, Pagosa Springs, Colo., July 5, 1937, R. H. Beamer. Allotype female and five paratype females, Mishawauka, Colo., August 11, 1937, R. H. Beamer; two paratype females same date and place, C. L. Johnston.

4. **Hebecephalus accuratus** n. sp. Fig. 4.

Resembling **Hebecephalus merus** Beamer, but posterior margin of last ventral segment almost straight, slightly excavated if anything and male plates with apices rounded and apices of styles not avicephaliform. Length 2.5-3 mm.

Vertex quite pointed, disc slightly convex, one-sixth longer at middle than width between eyes; elytra about as long as abdomen in male, shorter in female.

General ground color cinereous, marked with fuscous. Vertex with dark parallel chain markings enclosing a sagittate light area at apex and with a light dash in base of each chain. Veins of elytra quite regularly margined with fuscous, some of cells quite dark.

Genitalia: Last ventral segment of female slightly longer than preceding; lateral margins rounded at outer corner; posterior margin practically straight, very slightly excavated with very dark rectangular spot at middle. Male valve about twice as long as preceding, obtusely angular; plates about as wide as valve at base, narrowed to blunt apices about half width of base; styles widest at middle, one-third narrower on outer third, apex angular; aedeagus in lateral view with short, broad shaft with two pairs of retrorse processes, one pair at apex on side, the other ventral and just before apex, more than half as long as shaft and of about equal length.

Holotype male, allotype female, one male and 11 female paratypes, Silver City, New Mexico, August 22, 1936, R. H. Beamer.

5. **Hebecephalus acutus** n. sp. Fig. 5.

Resembling **Hebecephalus cruciatus** Osb. & Ball. but more robust; posterior margin of last ventral segment of

female practically straight across with but a small notch either side of a broad truncate median portion, pygofer hook of male large and blunt and apex of aedeagus rather rectangular in dorso-ventral view, with margins serrate. Length 3 mm.

Head wider than thorax; vertex angular, slightly longer than width between eyes, disc slightly concave; elytra longer than abdomen.

General ground color cinereous; vertex with three pairs of dark marks, a pair of small triangles at apex, a pair of heavy seven-shaped spots on middle and basal pair usually almost divided into four longitudinal dashes. Veins of elytra more or less evenly bordered with fuscous.

Genitalia: Last ventral segment of female about twice as long as preceding, lateral margins excavated from about middle to rounded lateral corners, exposing large underlying membrane, posterior margin straight with small notch either side of broad truncate median portion. Valve of male about twice as long as preceding segment, roundingly obtuse; plates broader at base than valve, lateral margins straight, slightly narrowed to truncate apices; pygofer with large overlapping apical hooks on ventral margin; styles with apical third sharply narrowed, curved out; aedeagus in dorso-ventral view widened on outer third, with lateral margins of this portion serrate.

Holotype male, allotype female and numerous paratypes, Mafeking, Manitoba, August 3, 1937, R. H. Beamer.

6. **Memnonia acuta** n. sp. Fig. 6.

Resembling **Memnonia albolinea** Ball, but smaller and with the vertex much more acute and base of vertex decidedly more convex. Length, male 3.25 mm., female 5.25 mm.

Vertex distinctly less than a right angle, also acutely angled with front; anterior fourth very flat, remainder steeply convex. Wings of female short, exposing 4 segments of abdomen, male wings usually entirely covering abdomen. Venation distinct in female, apical cells much reduced. In male venation indistinct due to intense black color.

Color: Females vary from cinereous with dusky veins to a specimen that has the following dusky portions: most of vertex; six broad longitudinal bands on

pronotum, four of them extended over scutellum; all veins; a lateral longitudinal stripe and a median pair of vittae more or less disconnected, on the abdomen; almost entire dorsal surface. Males are solidly black throughout with the following light marks: line on vertex margin from eye to eye, ivory; seven longitudinal lighter stripes on pronotum, three often extending on scutellum; occasionally 2 lighter dashes at base of vertex and a semblance of light areas in apices of antiapical cells and bases of apicals. Venter of male black except posterior margin of last three abdominal segments lighter.

Holotype male, allotype female, two female and numerous male paratypes, Little Beaver Creek, Colo., July 11, 1937, R. H. Beamer.

7. **Deltocephalus luteoapicalis** n. sp. Fig. 7.

Resembling **Deltocephalus flavicosta** Stal, but smaller and dorsum entirely black except anterior third of vertex, narrow stripe on costal margin, two arcuate dashes just before apex on costal margin and a narrow border at apex cinereous to yellow. Length female 2.5 mm.

Structure: Vertex rather long and pointed, slightly less than a right angle; median length greater than length between eyes. Elytra scarcely as long as abdomen.

Color: Dorsum black except slightly more than anterior third of vertex and narrow stripe on costal margin from humerus to slightly beyond middle lemon yellow and two arcuate dashes on costal margin just before apex and a narrow line at apex cinereous. Eyes and front black, clypeus and most of cheeks lemon yellow; thorax and anterior portion of legs light, most of abdomen and outer portion of legs dark.

Genitalia: Last ventral segment of female about three times as long as preceding; broadly rounded on lateral margins to expose underlying membrane for its entire length, posterior margin broadly rounded to a shallow notch either side of a definite median tooth of about same height as lateral lobes.

Holotype female, and two female paratypes San Antonio, Texas, July 4, 1936, R. H. Beamer; other paratypes as follows: two females, George West, Texas, July 4, 1936, D. R. Lindsay; two females, Elmendorf, Texas, July 3, 1936, R. H. Beamer.

8. **Parabolocratus nimbosus** Ball Fig. 8.

About 50 specimens of this beautiful species were taken from bunch grass near Chama, New Mexico. They range from straw-colored individuals with irregular sided, median longitudinal black stripe on vertex, pronotum and scutellum, to specimens that are entirely black. None of the specimens, however, has the cross-banded dark marking of the following species.

9. **Parabolocratus nigrafasciatus** n. sp. Fig. 9.

Resembling **Parabolocratus nimbosus** Ball but color on vertex and pronotum in form of black cross-bands, disc of vertex more convex and front more abruptly expanded. Length: female, 7.25 mm; male, 5 mm.

Vertex of female about as long as wide, male slightly wider than long; lateral margins in female parallel for about half their distance, then evenly curved to apex; male vertex about as outer half of female. Both disc of vertex and face more strongly inflated than in **P. nimbosus.** Elytra in female shorter than abdomen, exposing about 2 segments; in male may be either considerably longer than abdomen or shorter.

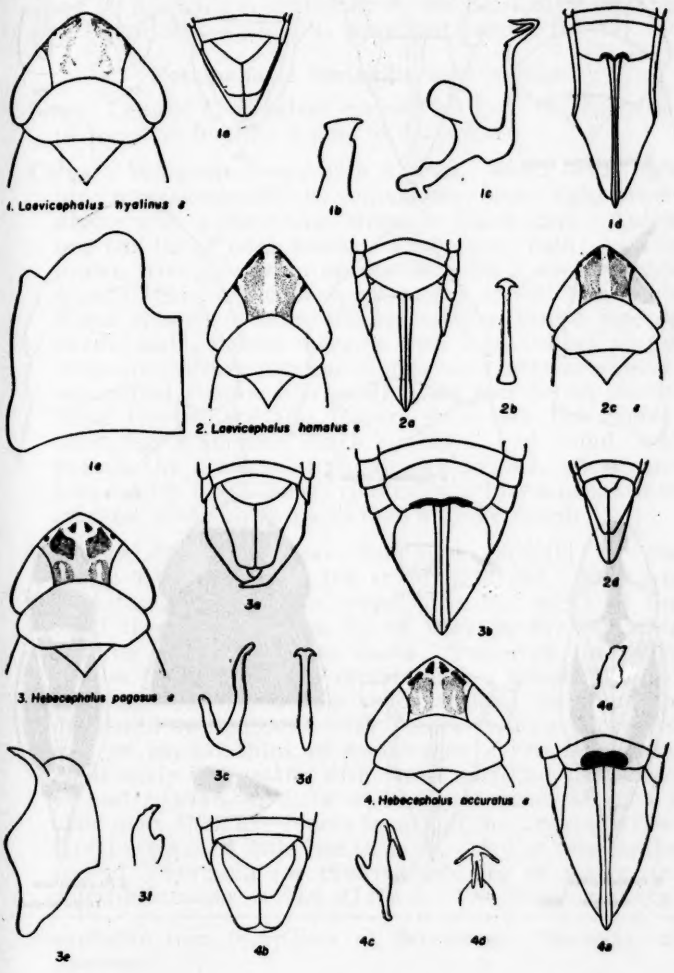
Color: General ground color stramineous with quite variable amounts of fuscous—from no black at all to quite dark individuals. Usually the black is as follows: vertex from anterior edge of eyes forward continuing below margin except a thin line on male on extreme apical margin; all of pronotum except narrow lateral border; apex of scutellum in female only; that portion of clavus inside outer claval vein except apex; oblong arc on disc of corium; more or less of surface of dorsum of abdomen exposed in female and in a majority of venter of male.

Genitalia: Last ventral segment of female about one-half longer than preceding segment, lateral margins rounded to slight median protrusion in form of three short, rounded lobes, median one slightly longest. Male valve about one-third as long as preceding segment; broadly rounded; plates wider at base than valve, rapidly narrowed to long, slender apices.

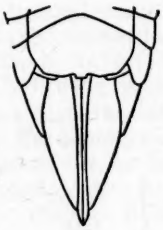
Holotype male, allotype female, three male and twenty female paratypes, Creede, Colo., July 6, 1937, R. H. Beamer; other paratypes as follows: one male and three females, same date and place, C. L. Johnston; two males and six females, same date and place, L. D. Tuthill.

This interesting species was taken in bunch grass by

grasping the bunches tightly with the hand and cutting them off at the surface of the ground, then shaking them out in the net. It was not uncommon to cut the specimens in half, indicating they stayed very close to the base of the plant.



5. Hebecephalus aculus



5a

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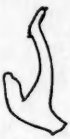

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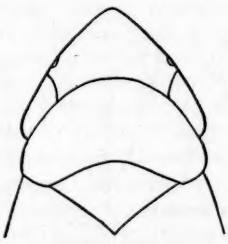
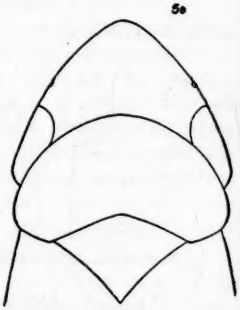


6. Mamnonia aculo ♂



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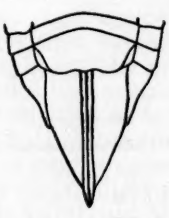
8. Parabolocratus nimbosus Bell

8a



7a

7. Deltocephalus bifasciatifrons ♀

9a

9. Parabolocratus nigrafasciatus

A THIRD NEW POTAMOBATES FROM PERU, S. A. (HEMIPTERA-GERRIDAE)

H. B. HUNGERFORD, Lawrence, Kansas *

In a recent shipment of material from the Department of Huanuca collected by F. Woytkowski is another new Potamobates which is described below:

Potamobates variabilis new species

Size: Length of wingless males 10.5 mm. to 10.9 mm.; of wingless females 9 mm. to 9.3 mm.

Color: Wingless forms only known. Black with light brown markings above; venter pale. Head light brown above with a somewhat elongate black spot. Antennae and tip of beak black. Pronotum with a pale brown triangular spot on dorsum and a silvery patch on the side behind each eye; the mesonotum solid black or with a faint slender median brown line on caudal half; lateral margins with longitudinal silvery stripe and silvery patches on meso-and meta-acetabula; abdominal dorsum black; all coxae and dorsal side of front trochanters and femora pale like the venter; front legs otherwise black, middle and hind legs brown, the femora longitudinally striped, above and below with black lines; connexivum black beneath or marked with brown spots that may be fused.

Structural Characteristics: Antennal formula of the male: 1st: 2nd: 3rd: 4th :: 60:20:21:30. First antennal segment a little longer than the width of the head through the eyes, tip of beak barely attaining anterior margin of front coxae. Pronotum a little shorter than the length of the head. Mesonotum of wingless male about 2.8 times as long as pronotum measured on median dorsal line; a median depressed line on caudal third of mesonotum. Front femora moderately incrassate with small peg-like projection on under side near distal end. Front tarsus of male a little more than one-fourth length of the tibia; the first tarsal segment a little less than one-third as long as the second. Formula for intermediate leg of male:- femur:tibia:tarsus :: 30.5:21:10.5. The first tarsal seg-

*Contribution from Department of Entomology, University of Kansas.

ment more than three times as long as the second. Formula for the posterior leg:- femur:tibia:tarsus :: 31.3:15:2. Posterior tarsus small, first segment longer than the second. The last abdominal tergite of the male slightly longer than the two preceding. In the male the connexivum is slightly produced behind. In the female the connexivum is produced into a long finger-like process about as long as the last abdominal tergite. The first genital segment of the male, measured on the median line, slightly longer than the last three preceding abdominal tergites. The general shape of this segment like that of **P. peruvianus** Hungerford, but having the caudal margin on the right side produced as shown in the drawings. The hook-like projection of the second genital while occupying the same position as in **P. peruvianus** Hungerford and **P. woytkowski** Hungerford is provided on its caudal margin with a large retrorsely and dorsally directed prong, a character which sets it apart from the group to which it belongs—which includes **Potamobates williamsi** Hungerford and **P. tridentatus** Esaki, beside the two mentioned above. The first dorsal genital of female triangular with caudal angle produced into a short, blunt, finger-like process which is but little, if any, longer than wide. The last ventral abdominal segment of the female (first genital) asymmetrical, its left side curled up over the side of the first dorsal genital.

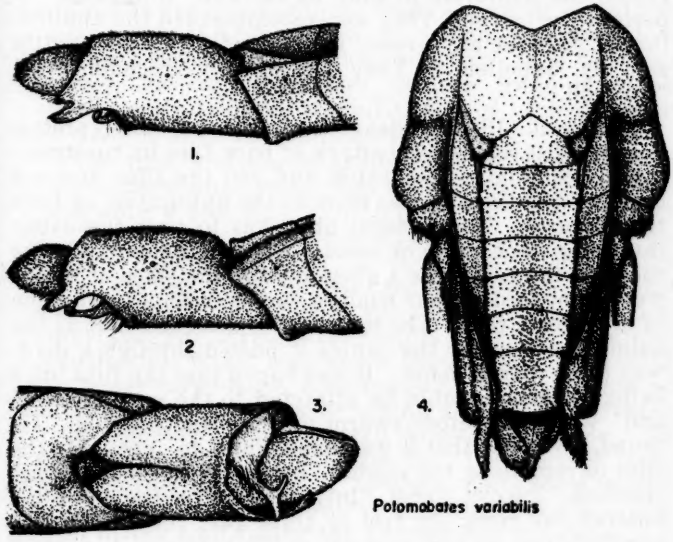
Location of Types: Holotype, allotype and paratypes in the Francis Huntington Snow Entomological Museum, University of Kansas. This species described from 12 males and 8 females, all wingless. Sixteen of them labeled: "Peru, S. A., June 10, 1937, F. Woytkowski, Dept. Huanuca, Vicinity of Afilador, Shady Jungle, 670 meters above sea level." The others taken between June 3rd and June 9th in Jungle at 800 meters above sea level, also in the vicinity of Afilador.

Comparative Notes: The males are readily recognized by the right caudal margin of the first genital, even though it shows considerable variation and by the prong on the second genital. The female, by having the finger-like processes of the connexiva shorter than the first dorsal genital, is separated from all but **P. tridentatus** Esaki, from which it differs in having the

caudal end of first dorsal genital short and blunt, instead of twisted and sharp-pointed as in Esaki's species.

Text figure—**Potamobates variabilis** Hungerford

1. Right side of male genital segments of holotype.
2. Right side of male genital segments of paratype to show variation in distal margin of first genital.
3. Ventral view of male genital segments of holotype.
4. Dorsal view of female abdomen of allotype.



A PRACTICAL TRAP FOR THE CONTROL OF HORN FLIES ON CATTLE.

W. G. BRUCE,
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Bureau of Entomology and Plant Quarantine.

Since the importation of the horn fly, **Haematobia irritans** (L.), into the United States in 1887, various investigators have sought an effective method of control. Riley and Howard (1889), the first investigators, suggested the scattering of lime on the cow droppings to destroy the larvae. They also recommended the application of "almost any greasy substance" to infested cattle as a fly repellent. They specifically recommended "train-oil."

Parrott (1900) endeavored to furnish better protection to cattle against the attack of horn flies by constructing a trap that would catch and kill the flies and not merely repel them as was done by the application of horn fly mixtures. The general plan was to pass the cattle through a dark space or room. At the center of the room, in the roof, was a glass cupola, the sides of which were composed of four window sashes, with a large pane of glass for a roof. The trap was so designed that as the animal went under the cupola it passed through a doorway lined with brushes. It was hoped that the flies upon being disturbed would be attracted to the greatest light and would therefore swarm up into the cupola. He found, however, that it was impossible to get all the flies to remain on the animal until the brushes were reached. Parrott states, "Invariably, after the cows had entered the room for two or three feet the flies would suddenly rise up and pass out at the entrance doorway." The results obtained with this type of trap were most unsatisfactory, as only about 5 per cent of the flies were trapped.

Loughnan (1930) describes a fly trap he observed in Mauritius. He states that this is "a darkened building through which the cattle walk and brush off or disturb any flies which may be on them, and the natural tendency of these insects to seek the light is utilized to attract them into a destructor trap." From the description of the trap given by Loughnan the building is probably 10 feet wide by 20 feet long, with two lengthwise partitions so the cattle traverse the length of the building three

times in passing through. The author did not identify the flies caught in this trap but states that the species of flies most commonly found in Mauritius are **Stomoxys** and, to a small extent, the common house fly.

A cattle fly trap which gives promise of effective control of horn flies and of greatly reducing the population of stable flies, **Stomoxys calcitrans** (L.), has been designed by the Bureau of Entomology and Plant Quarantine. Observations indicate also that this device may be useful in capturing other flies attacking livestock. Many traps of this type, some of which are patented, have been developed by other workers. It is believed, however, that certain features of the trap described herein greatly improve the efficiency of such a device and make it more generally useful.

The trap is of simple construction and can be built at a relatively small cost. The framework of the trap is 5 feet wide, 6 feet high, and 10 feet long (fig. 1, **A** and **B**). The base of the frame is made of 2- by 8-inch lumber, the remainder of 2- by 4-inch lumber. All pieces are securely bolted together with 3/8-inch bolts. The top is made of any inexpensive lumber. The passageway through the trap is 33 inches wide and approximately 6 feet high and is lined along the sides with heavy large-mesh wire fencing. On each side of the frame, set side by side behind the wire, are three screen trapping elements, each 37½ inches wide, 10 inches deep, and 5 feet high (fig. 2). These screen trapping elements are made of 18-mesh, galvanized screen and are of a modified tent-trap construction—i. e., the screen of the trap facing the passageway is folded in a series of Z's (fig. 1, **D**, and fig. 2, **C**). The apertures through which the flies enter the trapping element are three-sixteenths by three-eighths inch and are placed three-fourths of an inch apart along the inner acute angles of the Z's (fig. 1, **D**, **a**). Each trapping element is provided with a door through which the dead flies are removed (fig. 2, **D**). Two sets of curtains and six weighted strips are used to dislodge the flies from the cattle as they pass through the trap. Each set of curtains consists of three pieces of carpet—two pieces 20 inches by 6 feet and one short piece 24 by 30 inches. The two long pieces of one set are attached to the frame at the top and sides of the passageway between the first and second pairs of trapping elements (fig. 1, **C**, **a**). These long curtains,

being fully one-half as wide as the passageway, meet at the center. The short piece is suspended from the top at the same place of attachment as the long curtains (fig. 1, C, b). This serves to brush the flies from the backs of the cattle and also to darken the space above the animal, which is opened by the parting of the long curtains. The other set of curtains is installed in the same manner between the second and third pairs of trapping elements. The weighted strips are made of carpet 4 inches wide and about 6 feet long and are suspended at irregular intervals from the top of the trap between the two sets of curtains. The weights consist of small pieces of lead, iron, or other heavy material weighing at least 4 ounces, which are riveted to the strips near the lower

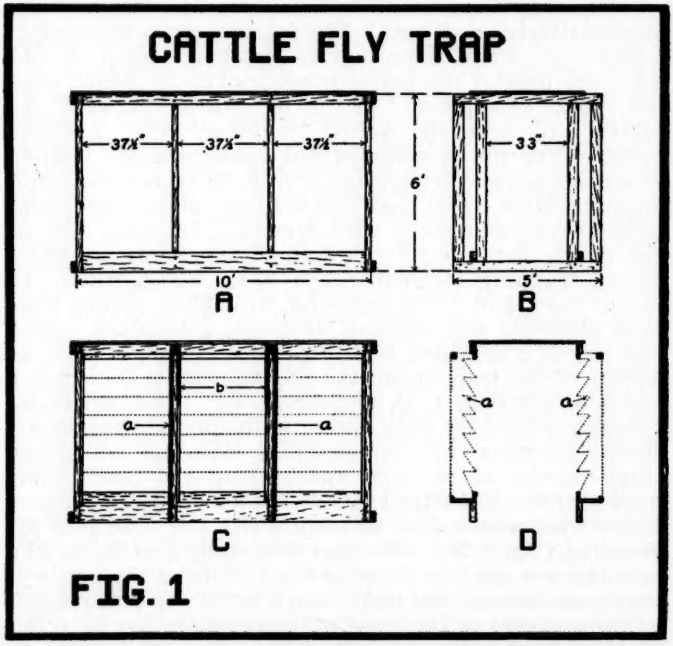

Fig. 1.—Drawings of cattle fly trap: A, Side view of frame; B, end view of frame; C, longitudinal section of trap, a, long curtains, b, short curtains; D, cross section of trap, a, a, two points where flies enter trap.

end. These weighted strips flap about the body and legs of the animal as it passes through the trap and dislodge flies not reached by the curtains.

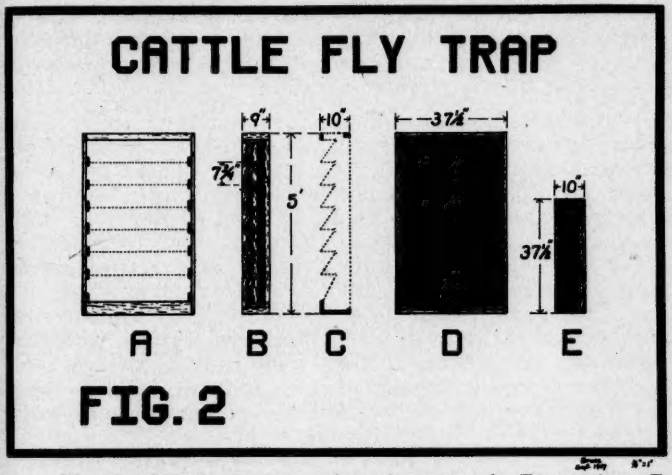

Fig. 2.—Drawings of trapping element: **A**, Front view; **B**, interior view of one end showing construction of Z's for screen wire; **C**, cross section; **D**, back view (note door for removing dead flies); **E**, top view.

It will be noted that the placing of the Z-shaped trapping elements along the walls of this trap takes advantage of the tendency of horn flies to fly outward and upward when they are brushed from an animal. Stable flies also rarely fly directly upward. The construction of the trap is such as to allow as much light as possible to enter, particularly on the side walls of the entrance section. This feature prevents the escape of any great number of flies through the entrance opening.

The location of the trap is important. The preferred location is a lane through which the cattle travel to and from water. Another suggestion is to construct a fence around the water supply and place the trap in the gateway so the cattle will be compelled to pass through the trap on the way to and from water. This will insure frequent use of the trap, and, obviously, the more often the cattle go through the trap the greater will be the degree of control.

After the trap is set up the cattle should be permitted to pass through it for a week or more before the curtains are installed. The curtains are then added, piece by piece, at 2- or 3-day intervals. This precaution is necessary in order not unduly to alarm the animals, especially wild range cattle, while they are being familiarized with the trap. Ordinarily it will take 3 weeks or more before the trap is in full operation.

A cattle fly trap of the model described above was placed in operation in the summer of 1937 on a ranch at Cresson, near Fort Worth, Tex. (fig. 3). This 5,500-acre ranch was divided into a number of pastures of approximately 500 acres each. About 40 head of Hereford cattle grazed in each of these pastures. This particular ranch was selected as an ideal place for a trapping experiment because it was possible to check the numbers of horn flies on cattle having access to the trap against the numbers on cattle in adjacent pastures. There were no significant differences in the topography of the various pastures, or in the numbers of cattle in them. At the time the trap was installed the horn fly population was esti-

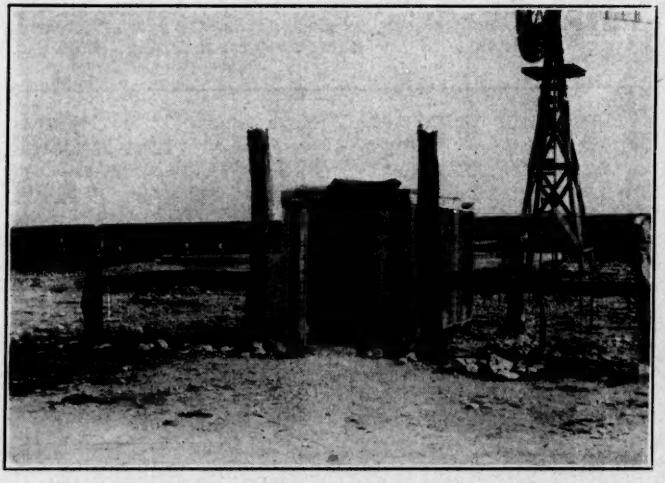

Fig. 3.—Photograph of cattle fly trap in operation on ranch at Cresson, Tex. (one curtain raised). Note wire to protect trapping elements.

mated at not less than 4,000 flies per head for cattle in all the pastures. In 2 weeks, and before all the curtains were installed, a 50-per-cent reduction of horn flies on cattle in the trapped pasture as compared with flies on cattle in adjacent pastures was recorded. After the third week the horn flies ceased to be troublesome in the trapped pasture. There was no reduction in the numbers of the horn flies on the cattle in adjacent pastures, and the flies were so troublesome that the cattle sought protection in the high weeds and brush and often refused to graze until nightfall.

It is indicated from these results that horn flies do not travel any considerable distance under range conditions and hence there is little likelihood of pasture reinfestations on this account, although reinfestation no doubt does occur to a certain extent from animals in adjacent pastures. The constant use of the trap, however, by the animals during the fly season would greatly reduce fly breeding and prevent the building up of a large fly population.

Another trap of similar design was operated on the laboratory premises of the Bureau of Entomology and Plant Quarantine at Dallas, Tex., where four heifers were used as experimental animals. At no time after the trap was installed were more than 10 horn flies found on any one animal, though hundreds of horn flies were released on these cattle from time to time.

A third trap of similar design, operated at a dairy near Dallas, Tex., was highly satisfactory in controlling horn flies and in greatly reducing the population of stable flies.

The trap described herein is not yet considered perfect, but the results obtained in 1937 clearly demonstrate that the cattleman can now be provided with a practical, efficient, and economical fly trap that will control horn flies.

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OBSERVATIONS ON ROACH REPRODUCTION

LAURENCE C. WOODRUFF, Lawrence, Kansas *

Over a period of seven years I have been using roaches (**Blattella germanica** L.) as test animals in nutrition and growth research. Naturally, during the course of these investigations I have handled an enormous amount of material and much interesting as well as valuable information has been gained. With no definite object in mind I have recorded these observations and in publishing them here I make no attempt to cover the whole field of reproductive biology, but rather to point out those features which may be of interest or of practical value to those who contemplate using this insect as a laboratory convenience.

It is a well known fact that all roaches produce their eggs in an enclosing capsule which is carried by the female for a greater or lesser period of time, clasped in an external pocket formed between the sterna and terga of the posterior abdominal segments. Not so well known is the fact that the German roach retains the capsule until, or immediately before, the hatching of the eggs. Other roaches may, and usually do, deposit their oothecae after a few days, leaving their safety in the hands of chance, but this species retains the egg case at least until a very few hours prior to eclosion, often until all of the young have gained their freedom. As is commonly the case with the American roach, I have never seen free, viable capsules in the rearing cages. Spent capsules are frequently found in the vicinity of food, surrounded by the young nymphs, indicating that they may have been discarded within a few hours of hatching. On the other hand, I repeatedly have seen nymphs emerging from capsules still in the grasp of the mother. When experimental procedure demanded that oothecae be removed early for sterilization, considerable difficulty was encountered in inducing eggs so treated to hatch. As a matter of fact, capsules allowed to remain in position in the grasp of females, which had been killed mechanically, seldom hatched. A few days (usually within 72 hours) prior to hatching, a dark band appears along the mid line of the case, resulting from the accumulation of meta-

* Contribution from the Department of Entomology, University of Kansas.

bolites within the alimentary canals of the developing embryos. Capsules removed before the appearance of this indicator invariably failed to hatch, and many also failed unless detachment had been delayed for two or three days.

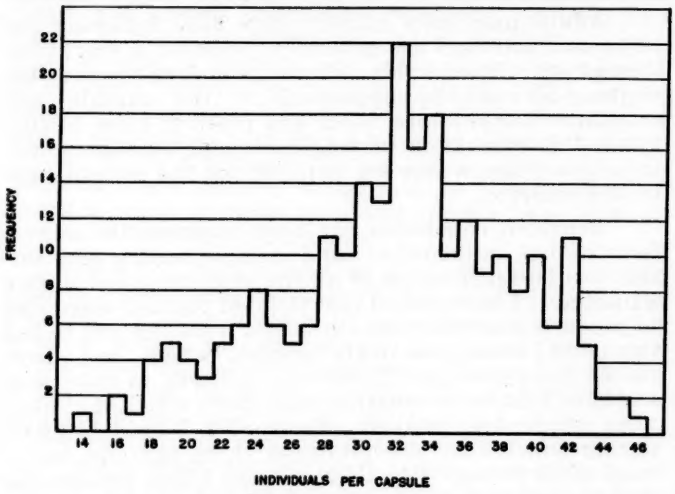
Adults may mate within a few days following the last moult and eggs are generally produced a short time thereafter. Considerable variation was found in the time elapsing between the appearance of the capsule and eclosion. Temperature, food, and possibly other factors affect this incubation period, but under average conditions about two weeks are required for the development of the embryos.

Repeated copulation has been observed for several females, but on the other hand a single mating may suffice for the fertilization of all the eggs produced during a lifetime. I had noticed that isolated females were able to produce more than one capsule to a mating and to test this point I chose five virgin females which had been reared from the egg. These were allowed to mate once and then isolated in separate cages from which the young were removed as hatched. Female No. 1 lived 155 days during which time she produced three capsules and a total of 85 young. Female No. 2 was killed accidenatlly while carrying her second capsule, 36 young having hatched from the first. Female No. 3 produced three capsules and 90 young during her life period of 192 days. This individual lived until September 23 after hatching her last young on June 8 and she alone, among the five, lived long enough to develop more oothecae had subsequent matings been allowed. Four capsules and 118 young in 122 days was the accomplishment of female No. 4. The last female, No. 5, lived 129 days and produced 88 young in three capsules.

No direct data were kept on the length of adult life or upon the total number of eggs produced. Several females lived in confinement in four ounce bottles for a period of six to ten months during which time each produced from four to as many as seven capsules.

That this roach is a prolific breeder is attested by the size of the clutch emerging from each ootheca. No attempt was made at dissection to determine the actual number of eggs in each case since to do so would have destroyed the viability of embryos needed in other ex-

periments. However, records of the number of nymphs emerging have accumulated for 246 capsules, and these data are shown graphically in the accompanying figure. The average for the entire lot is 31.9 plus or minus 0.291.



Frequency distribution for number of nymphs hatching from oothecae.

A STUDY OF THE INCIDENCE AND HABITS OF COCHLIOMYIA AMERICANA BY MEANS OF FLYTRAPS [1]

ARTHUR W. LINDQUIST,
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Bureau of Entomology and Plant Quarantine

In the vicinity of Uvalde, Tex., females of **Cochliomyia americana** C. & P. have been found only on wounds of warm-blooded animals, carrion, and fresh cow dung. Carrion seemed to be quite attractive to the female fly. Males were rarely observed on carrion, but were occasionally seen on cow dung. Females have been observed feeding on the carcasses of rabbits, squirrels, opossums, deer, sheep, goats, and calves.

In the spring of 1935 it was found that **Cochliomyia americana** could be caught in liver-baited fly traps in appreciable numbers. This suggested a useful supplemental means of studying the seasonal activity, relative abundance, and dispersion of the adult fly, especially in areas where the presence of the pest might not be indicated by infested animals, owing to the absence of susceptible wounds.

Since **Cochliomyia americana** is attracted to traps, and the number caught represents previous infestations in animals and suggests the degree of danger of future infestations, it is believed that the use of liver-baited fly traps will be of some value for studying certain biological relationships and in predicting local outbreaks of this species.

The data presented herein were obtained from collections of flies from a status trap (standard Government fly trap) (Bishopp 1916) operated continuously in the same location at Uvalde, Tex., from July 15, 1935, to October 30, 1937. The trap was set 3 feet off the ground in a mesquite tree in a native pasture and baited with 2 pounds of beef liver and 6 quarts of water. It was emptied twice a month. Additional data were collected from similarly operated traps set within a distance of 5 miles of the status trap. These traps were operated only during the period from May 9 to August 13, 1936.

1 Acknowledgment is made of the assistance and suggestions given by D. C. Parman.

Because **Cochliomyia americana** closely resembles **C. macellaria** F., the common blowfly of the Southwest, the determination of the former species in large catches of flies is difficult. In these studies the number of **C. americana** in relation to the other species of blowflies rarely exceeded 0.5 per cent. The catches of flies were weighed, and either an entire catch or a sample comprising from one-third to one-eighth of the flies was examined for the number of **C. americana;** then the total number present was computed.

Incidence of adults of Cochliomyia americana.— Figure 1 shows the number of females of **C. americana** caught in the status trap. The fly population in March 1936 and March 1937 was indicated to be very low, but a gradual and definite increase is shown until the peak in June, 1936. A decided drop in the fly population is shown during the hot, dry weather in August and September 1935, and in July and August 1936 with slight increases again during the fall months when the temperatures were lower. Data for other periods in 1937 given in Table 1 show that a peak in fly abundance was reached in June and a rapid decline in numbers took place during July and August followed by slight increases during the fall months.

The low catch of 25 flies on July 15, 1937, appears to be at variance with the catches of other years, but this might have been the result of the removal of the sheep

Table 1.—Mean temperature, rainfall, and numbers of **Cochliomyia americana** caught in a fly trap for certain periods during 1937. Uvalde, Tex.

One-Half Month Period Ending	Mean Temperature	Rainfall	Cochliomyia americana caught
	Degress F.	Inches	Number
June 15	81.0	2.79	93
June 30	84.6	.01	222
July 15	83.4	.77	25
July 31	86.8	0.00	92
August 15	88.2	0.00	42
August 31	87.1	0.00	6
September 15	84.4	1.76	16
September 30	78.1	.02	48
October 15	77.0	.73	13
October 31	68.7	.86	77

and the burning of the pasture, for another trap 3 miles distant caught 140 flies during the same period.

The sudden increase in the population of the fly in the first part of January 1936, and in the last part of December 1936 and first part of January 1937, is explained by the fact that cool weather prior to these periods had been retarding the emergence of adults from larvae that had dropped from infested animals during November. With the advent of a warm period, as shown in fig. 1, the emergence of **Cochliomyia americana** was considerable, as indicated in overwintering tests, and a large catch in the trap resulted. Larvae of **C. americana** that dropped in outdoor cages at the laboratory in November emerged during the time these large catches were being made in December and January.

The increased fly population was not accompanied by an immediate and proportionate number of screwworm cases, although wounds on animals were prevalent because of docking and castration of sheep on various ranches. Cases began to appear in numbers, however, a few days later. Since no infestations occurred immediately, with the large number of flies present, it appeared that this brood of flies was in the preoviposition stage and that at least a considerable number were seeking food at carrion prior to oviposition on animals. This observation is supplemented by the data presented later in this paper on the comparison of the egg development in the flies caught over wounds and over carrion.

In general, the population trend of **Cochliomyia americana** followed the incidence of screwworm cases in livestock. It is common knowledge among the ranchmen in Uvalde County that during March and April, 1935 to 1937, the screwworm infestations in livestock were comparatively light, but that, as the season advanced, cases became more and more numerous until June or July. Infestations became less frequent during the hot summer months. With the advent of fall and cooler weather the number of cases again increased. The foregoing information is confirmed by frequent observations and collections of larvae in animals. Screwworm cases were much easier to locate in May and June, and more difficult late in the summer and late in the winter.

The temperatures in fig. 1, which are the daily mean averages for each half month, indicate the fly activity, in

so far as flight and feeding are concerned, occurred from semimonthly mean temperatures of 45.3 degrees to 88.2 degrees F. Fig. 1 also shows that the population of **Cochliomyia americana** fell off considerably and quite rapidly when the mean temperature during the summer months reached 80 degrees or above, especially when rainfall was light. Low winter temperatures were also effective in decreasing the number of flies. The population was reduced to near zero during February and March, 1936 and 1937.

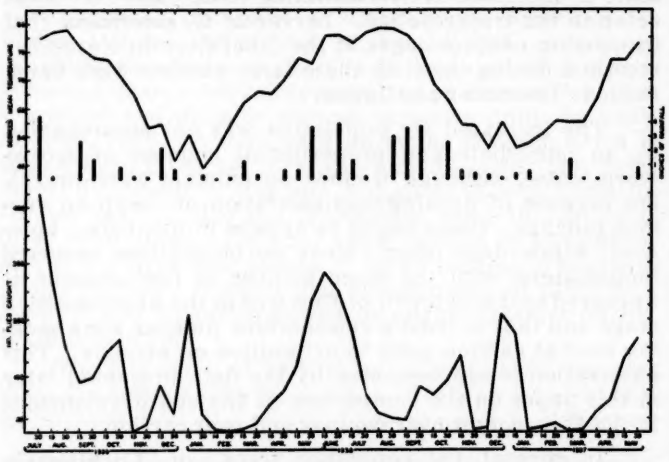

Fig. 1.—The numbers of **Cochliomyia americana** caught in a liver-baited fly trap, together with mean temperatures and rainfall, July 15, 1935, to May 30, 1937. Uvalde, Tex.

The ratio of Cochliomyia americana to C. macellaria.—Laake et al. (1936) gives the comparative abundance of **C. americana** and **C. macellaria**, as determined by the attractiveness of wounds, as 1 of the former to 590 of the latter. The ratio of the two species taken in a standard meat-baited fly trap during a 7-day test at Menard, Tex., showed 1 of **C. americana** to 2,427 of **C. macellaria.**

At Uvalde, Tex., the ratio of **Cochliomyia americana** to **C. macellaria**, as determined by the liver-baited status trap, averaged 1 to 912, with a range of 1 to 36 to 1 to

10,962 during the 27½ months of the study. Usually about one-half of the **C. macellaria** caught in traps were males whereas only the females of **C. americana** came to the traps, which would make the average ratio of the two species approximately 1 to 456. The average ratio of **C. americana** females to **C. macellaria** males and females during December 1935, and January and February 1936, was 1 to 103, and during the same period in the next winter was 1 to 100, which indicates that **C. americana,** as compared to **C. macellaria,** was a great deal more abundant during the winter months than the average for the year. A study of the ratios occurring in the winter indicates that low temperatures decreased the population of **C. macellaria** to a greater extent than it did that of **C. americana.**

A 10-day test in September 1935 showed a ratio between **Cochliomyia americana** females and **C. macellaria** males and females of 1 to 191, as determined by the attractiveness of an infested goat, and 1 to 2,896, as determined by the attractiveness of liver. In this test 28 **C. americana** were caught in an improvised screen trap on a wounded goat, and 96 were captured in a standard trap baited with liver. A similar 15-day test in July, 1936 showed a ratio of the two species of 1 to 33 on infested wounds of sheep in another type of screen trap, and 1 to 1,000 over liver. In this instance, 98 of **C. americana** were caught on the wounds and 224 over liver. While it is obvious that several unconsidered factors may have decreased the accuracy of these comparisons, the data are presented here to indicate the results that might be expected from similarly conducted tests.

It is evident that the comparative abundance of the two species as indicated by the numbers attracted to wounds and traps varies according to the season, the attracting media, and very probably according to differences in local environment. Whether the numbers trapped on liver or on wounds indicate the exact ratio of the two species as they exist in nature is not known, but it is significant that carrion, which has not been found to breed **Cochliomyia americana** is to a certain degree attractive to the females of this fly.

The number of Cochliomyia americana caught in traps.—The status trap caught 4,845 females of **C. ameri-**

cana during the period of study. The largest 15-day catch was in July 1935, when 425 were taken. Three catches, collected November 15, 1935, February 29, 1936, and March 15, 1937, failed to disclose any of **C. americana.**

From May 9 to August 13, 1936, one to three liver-baited traps were operated intermittently for 10-day periods within 5 miles of the status trap. During these periods, comprising 115 trap days, 2,312 females of **Cochliomyia americana** were caught, with an average daily catch per trap of 20.1, a maximum of 29.7, and a minimum of 10.8. The status trap, which was operated for 15-day periods, caught an average of 11.5 of **C. americana** per day during the same period. This indicates that liver bait is probably more effective in the shorter period and that the location of a trap is a factor in the catching of **C. americana.**

The egg development of Cochliomyia americana caught in traps.—With the object in view of learning something about the oviposition habits and longevity of **C. americana** caught in traps, live females were taken out of traps at frequent intervals, brought to the laboratory, and put into small cages under insectary conditions. As the flies died they were dissected and the size and development of the eggs determined. The state of development of the eggs was designated as (1) large, apparently fully developed, (2) partly developed, and (3) immature. It was early demonstrated that flies caught in traps would oviposit viable eggs on wounds of animals.

A study of 251 flies caught from April to December, 1936, showed an average longevity after capture of 3.4 days, with a maximum of 38.7 days and a minimum of 1 hour. There is no doubt that the remaining life was shortened by congested conditions in the trap, and the

Table 2.—The egg development in **Cochliomyia americana** flies caught in liver-baited traps.

Time Flies Lived after Removal from Trap	Percentage of flies containing—		
	Large Developed Eggs	Partly Developed Eggs	Immature Eggs
36 hours or less	15.7	19.3	65.0
Over 36 hours	37.2	8.5	54.3
Average	24.3	14.9	60.8

handling of the flies in small cages. It is concluded that the life of some females of **Cochliomyia americana** is not at an end when they are attracted to carrion; rather, it appears that a comparatively long life is yet to be consummated.

In Table 2 is shown the status of the ova in the flies that lived less and those that lived more than 36 hours after removal from the trap.

Of the flies that lived 36 hours or less, 15.7 per cent contained large, developed eggs at death, whereas in those that lived over 36 hours, 37.2 per cent contained developed eggs, which indicates considerable development of the eggs with age of the flies. It must be stated, however, that the feeding of the flies was infrequent and inadequate for egg production. The egg development in the flies caught over liver ranged from small to large, but 65 per cent of the 36-hour-old flies contained small or immature eggs. A similar percentage was found in flies that were killed immediately upon capture over various carcasses.

In contrast to flies caught over liver bait, the examination of 112 flies caught on infested wounds of animals showed that 89 per cent contained large, developed eggs, apparently ready for oviposition. These flies were killed and examined 24 hours after capture.

These data show that 65 per cent of the flies attracted to liver, and 11 per cent of those attracted to wounds, contained small or immature eggs. Carrion, apparently, was a preferred feeding medium and most of the flies visiting it were probably in the preoviposition stage. Wounds, also, were feeding places, but the records indicate that the majority of flies came there apparently ready to oviposit.

Summary and conclusions.—Decaying flesh was found to be an important feeding material for **Cochliomyia americana,** and liver-baited fly traps were valuable in the study of the adult population of the pest.

The incidence of **Cochliomyia americana** females increased gradually during the spring and showed a rather rapid decline during the hot, dry weather of the summer with a rise again in the fall. During the late winter season the fly population was reduced to the lowest numbers of the year. In general, the fly population followed the incidence of screwworm cases in animals.

An average of 20.1 **Cochliomyia americana** were caught per day per trap, when liver was used as bait, in the spring and summer of 1936.

Trap-caught flies oviposited viable eggs on wounds on animals and lived an average of 3.4 days after being taken out of traps. The majority of the flies caught over liver bait were indicated to be in the preoviposition stage while those caught on wounds were apparently ready for oviposition.

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GONIODES CENTROCERCI, A NEW MALLOPHAGAN FROM GROUSE.

FELIX SIMON,
University of Wyoming Agricultural Experiment Station.

During the last several years nearly a hundred sage grouse from various localities in Wyoming have been examined by parasitologists on the staff of the University of Wyoming Agricultural Experiment Station. Only two species of Mallophaga were taken from these birds: **Lagopoecus perplexus** Kellogg and Chapman, 1899; and **Goniodes centrocerci** n. sp. here described. The latter is considerably more common.

Described from 82 individuals; 29 immature, 42 female, and 11 male; collected from sage grouse in Wyoming and Montana as follows: 13 specimens from Fergus County, Montana, 1931, loaned, for this study, by the Rocky Mountain Laboratory at Hamilton, Montana; 22 specimens from the region of Daniel, Wyoming, 1934, by George L. Girard; 4 specimens from the region of the Graham Ranch, Wyoming, 1934, by John W. Scott; 8 specimens from the region of Wallrock Canyon near Laramie, Wyoming, 1936, by Felix Simon; and 35 specimens from the region of Battle Mountain, Wyoming and the Miller Hill Refuge, Wyoming, 1937, by Ralph F. Honess and Felix Simon.

Description of male: Head 1.24 times as wide as long; widest at apex of angulate temples; forehead widest just in front of antennae. Occiput concave posteriorly. Trabeculae absent, but postero-lateral expansion of forehead partially covering antennal fossa anteriorly. Eyes prominent, bordering antennal fossa posteriorly; thick cornea clear, bearing single, long ocular seta. Pharyngeal sclerite prominent. Color light brown. Antennae short, capable of extending backwards as far as the lateral apex of the temple; first segment greatly enlarged and as long as the last three combined; second segment not quite so long as the last three combined; process of third segment projects mediad and is larger than the rest of the segment; fourth and fifth segments about the same size. One long seta mediad to each eye; one in the fossa just anterior to each antenna; one long seta and one very short, spike-like seta on each lateral apex of the temples; and one, rarely two, long setae in each posterior concave face of the temples.

Thorax two-thirds as long as head, light brown in color with darker margins. Prothorax roughly trapeziform, with a dorso-lateral seta near each posterior angle. Pterothorax with two dorso-lateral setae near each posterior angle, and two dorsal setae a third of the way mediad from each side. Progressing posteriorly the legs become successively longer, and the coxae more widely separated.

Abdomen of nine segments, short, with rounded sides; widest at segment four; the first segment longest; segments two to five about equal; six to eight becoming successively reduced with sides increasingly rounded forming a truncate posterior end, the truncate appearance being broken by the extrusion of the ninth segment. Lateral abdominal bands are deep and conspicuous. Spiracles on segments two to seven inclusive. Chaetotaxy: Segment one: two or three lateral setae near each posterior angle, and two to four dorsal setae about a third of the way mediad from each side. Segments two, three, and four: three lateral setae near each posterior angle; two or three behind each spiracle. Segments five and six: four lateral setae near each posterior angle; two or three behind each spiracle. Segment seven: the setae near the posterior angle and those behind the spiracle are confluent, forming a row of eight or nine on each side. Segment eight: two setae at each posterior angle. Segment nine: more than twenty setae in all. There are

a few mid-dorsal setae on all segments except six, seven, and eight. Each of segments two to seven bears two setae near the middle of the sternite. Segments eight and nine have a few ventral setae. There may be one or two small, adventitious setae with those behind the spiracles on segments two to seven, or with those a third of the way mediad on segment one.

Description of female: Head as in male except larger and angles of temples sharper. Antennae shorter; segment two is longer than segment one, though not so long as the last three segments combined. Segment three bears no process.

Thorax as in male but comparatively shorter and wider.

Abdomen similar to male but longer and more ovoid, being without the truncate appearance. Ninth segment not extruded beyond eighth. Segments one to seven bear five to six mid-dorsal setae. There are two lateral setae at the anterior angle of the eighth segment, as well as two at the posterior angle. Only one large seta on each side of the ninth segment. Seventh segment bears a pair of cerci.

Average measurements in mm.

	Male		Female	
	Length	Width	Length	Width
Head	0.623	0.784	0.708	1.009
Thorax	0.421	0.641	0.440	0.716
Abdomen	1.067	1.101	1.476	1.224
Total	2.111		2.624	

Immature forms with the same chaetotaxy and of the same general shape except for comparatively larger and more rounded abdomens.

Type host: Sage grouse, **Centrocercus urophasianus**

Type locality: Battle Mountain, Wyoming. Paratypes from Miller Hill Refuge, Wyoming; Daniel, Wyoming; Graham Ranch, Wyoming; Laramie, Wyoming; and Fergus County, Montana.

Type slide: U. S. N. M. Number 52636. Paratypes in the parasitology collection of the Experiment Station at the University of Wyoming.

Discussion: By way of distinguishing **G. centrocerci** n. sp. from related species and from species infesting hosts closely related to the sage grouse: **G. cupido** is less than half the size of **G. centrocerci** n. sp. The head of **G. mammillatus,** a very similar species, is longer than wide. **G. cervinicornis** is fifty per cent larger than **G. centrocerci** n. sp., and the male bears a process on the first antennal segment. **G. tetraonis** and **G. dissimilis** are less than half the size of **G. centrocerci** n. sp.; also **G. dissimilis** bears a spiracle on the first abdominal segment according to Nitzsch's plate in Denny. Although Packard's description of **G. merriamanus** suggests a very similar form, the drawings accompanying the description are distinctly different from **G. centrocerci** n. sp. Packard states that the antennae are four segmented, but his drawing of the female shows three segments, of the male, five.

Between the Sandstone Ranger Station and Battle Mountain, not far from the latter, 42 Mallophaga of the genus **Goniodes** were collected from the blue grouse **Dendragapus obscurus obscurus** by Ralph F. Honess and Felix Simon, 1937. Although there were slight differences in the male genitalia, these lice were identified as **G. centrocerci** n. sp.

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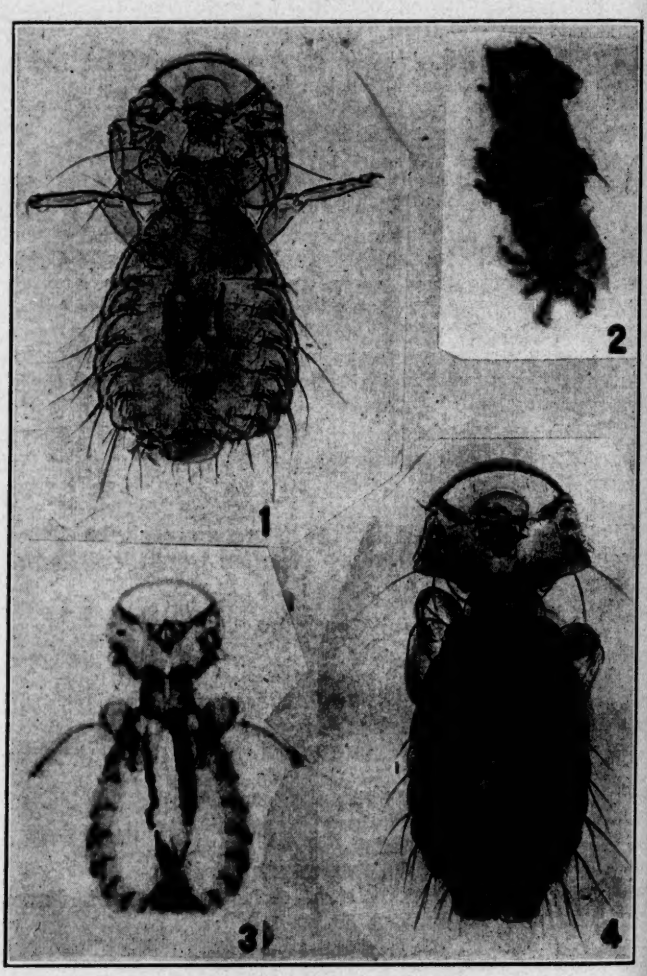

EXPLANATION OF PLATE

Figure 1. Goniodes centrocerci n. sp. male.

Figure 2. Goniodes centrocerci n. sp. male genital armature 97 x.

Figure 3. Goniodes centrocerci n. sp male, showing genital armature in situ.

Figure 4. Goniodes centrocerci n. sp. female.

BLOOD PULSATIONS IN EUXOA DETERSA (WALKER)

DON B. WHELAN
University of Nebraska, Lincoln, Nebraska

Because of the unpigmented condition of the skin, the cutworm **Euxoa detersa** (Walker) offers a good opportunity for studying the pulsations of the dorsal blood vessel. On June 23, 1937, a few such observations were made on these larvae, but no records were kept of surrounding environmental conditions, such as temperature and humidity. Sixteen cutworms were observed and the number of pulsations per minute were recorded. Each individual was confined in a tin salve box along with food and a small amount of sand. Two observations were made on each individual. First, the pulsations were counted when the cutworm was undisturbed, as shown in column I of the table below. Then the larva was prodded into movement, and the second observations were made, as recorded in column II of the table. The count on the undisturbed cutworms showed a variation from 8 to 48, with an average of 26.5, for the sixteen cutworms, while the count taken after they were disturbed varied from 10 to 60 with an average of 34.5. The summary of the counts taken are shown in the following table:

Cage No.	Locality Collected	Pulsations per Minute I	II
1.	West Point, Neb.	48	60
2.	West Point, Neb.	34	40
3.	West Point, Neb.	40	40
4.	West Point, Neb.	22	28
5.	West Point, Neb.	24	24
6.	West Point, Neb.	24	40
7.	Pierce, Nebr.	10	18
8.	Pierce, Nebr.	40	50
9.	Pierce, Nebr.	18	28
10.	Pierce, Nebr.	42	46
11.	Pierce, Nebr.	26	30
12.	Pierce, Nebr.	10	30
13.	Pierce, Nebr.	30	48
14.	Pierce, Nebr.	8	14
15.	Pierce, Nebr.	40	46
16.	Pierce, Nebr.	8	10
Average		26.5	34.5

Minutes of the 14th Annual Meeting of the Kansas Entomological Society—Kansas State Teachers College, Pittsburg, Kansas, April 2, 1938

Business Meeting.

Vice President L. C. Woodruff called the meeting to order at 10:00 A. M. in room 203, Carney Hall, and at his suggestion those present stood in silence for one minute in memory of our deceased President, Dr. Warren Knaus.

The minutes of the 13th annual meeting were read and approved.

Reports of Officers.

The secretary-treasurer's report was read and approved. A summary of the report is as follows:

Receipts, April 1, 1937 to March 31, 1938	$716.41
Disbursements, April 1, 1937 to March 31, 1938	496.78
Balance	$219.63
Assets: U. S. Savings bonds, maturity value $850.	$637.50
Accounts receivable	13.89
Balance in checking account	219.63
	$871.02
Liabilities: Due on separates, uncollectable account	4.78
Net Assets, March 31, 1938	$866.24

Report of Editor: —not received

Appointment of Committees:

Vice President Woodruff appointed the following committees:

Resolutions:—H. B. Hungerford, Ralph Voris,.. Roy Fritz.

Nominations:—R. C. Smith, R. H. Beamer, Dwight Isely

Auditing:—H. R. Bryson, L. S. Henderson.

Old Business:—none

New Business:

At the written request of R. L. Parker, the question of reducing the price of reprints was introduced. The opinion of the meeting was that no action should be taken at the present time, early publication of manuscripts more than out-weighing any other consideration.

Then followed the presentation of papers, the program consisting of 16 titles as follows:

1. The Identification of Burrowing Insects by their Burrow Characteristics. Harry R. Bryson, K. S. C.

2. Observations on the Ecology of the Corn seed beetle (**Agronoderus pallipes** Fab.) Franklin Dillon, D. S. C.

3. Some Notes on the family Belostomatidae of the Western Hemisphere. D. Warren Craik, U. of K.

4. Report on some New Species of Water Bugs. H. B. Hungerford, U. of K.

5. Variation in **Habrodais grunus** (Boisd). Lepidoptera: Lycaenidae. Wm. D. Field, U. of K.

6. Some notes on Curculionidae, Lyman S. Henderson. U. of K.

7. The Oviposition of Corixids upon Crayfish. Melvin E. Griffith, U. of K.

8. Corixid Eggs as Human Food in Mexico. H. D. Thomas, U. of K. Motion picture.

9. Possible Physiological Factors in the Distribution of Notonecta in Mexico. H. D. Thomas, U. of K.

10. Observations on the 1937 Grasshopper Survey. Roland W. Portman, K. S. C.

11. The Internal Sac of the Male Genitalia as Taxonomic Character in Phyllophaga. Milton W. Sanderson. U. of Ark., Fayetteville.

12. Some Entomological Observations made during Termite Inspections. C. R. Rogers, Wichita.

13. Chrysopidae Seen in European Museums. R. C. Smith. K. S. C.

14. Fluctuation in the Grasshopper Population in Grass Lands during the Drouth Years, 1933-1937. Donald A. Wilbur and Roy Fritz, K. S. C.

15. Parasites Reared from the Strawberry Leafroller (**Ancylis comptana** Froel). Ralph L. Parker and Paul G. Lamerson, Kan. Agr. Exp. Sta.

16. Preliminary Report on Distance as the Isolating Factor in three Species of Eurytomidae. Robert E. Bugbee, College of Emporia.

Final Business:

Auditing Committee:

The treasurer's accounts for the period April 1, 1937 to March 31, 1938, have been audited this 2nd day of April, 1938, and found to be in order.

Signed: H. R. Bryson, L. S. Henderson.

Motion made and carried to accept the report of the auditing committee.

Resolutions committee:

The following report was submitted:

Whereas the local committee of the academy has provided not only convenient quarters for the sessions of our society but made special efforts to furnish opportunity for interesting and informative field excursions.

Be it resolved that we extend our appreciation to this committee for their labors in our behalf.

Whereas one of our members, Professor Geo. A. Dean, as retiring president of the Kansas Academy of Science, has devoted considerable time and energy in seeking out and assembling valuable information concerning the Entomological contributions from the State of Kansas and in presenting these facts of historical interest for record in the Proceedings of the Academy,

Be it resolved that the Entomological society express to him its appreciation for this splendid service.

Whereas our society has suffered the loss of Doctor Warren Knaus, president of the society, a faithful charter member whose generous cooperation made possible the establishment and continued publication of the Journal of the Kansas Entomological Society,

Be it resolved that our society express to Mrs. Knaus and other members of his family our deep regret occasioned by his death and our gratitude for this unusual devotion to the society.

Roy F. Fritz
Ralph Voris
H. B. Hungerford, chairman

Motion made and carried to accept as a whole the report of the resolutions committee.

Nominations Committee:

The committee placed in nomination the following members for officers for the year:

For President	L. C. Woodruff
Vice President	R. T. Cotton
Sec. Treas.	H. H. Walkden

R. C. Smith moved that the secretary cast a unanimous vote for these officers. Motion seconded and passed.

It was voted to hold the next annual meeting at Lawrence, Kansas.

Adjournment at 2:30 p. m.

There were 35 members and friends in attendance, from Manhattan, Lawrence, Leavenworth, Fort Scott, in Kansas and from Springfield, Mo., and Fayetteville, Ark.

H. H. WALKDEN, Secretary-Treasurer.

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